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Application No. 10/804,719

REMARKS

Claims 1, 4-14, 17-19, 28 and 31-33 are pending. By this Amendment, claims 2-3, 15-16, and 29-30 are cancelled, and claims 1, 4-6, 10-11, 17-19, 28, and 31-33 are amended.

Rejection Under 35 U.S.C. § 119(e)

The Examiner asserted that Applicants have not compiled with one or more conditions for receiving the benefit of the earlier filing date under 35 U.S.C. 119(e) because the provisional applications upon which the benefit of priority is claimed fail to provide adequate support under 35 U.S.C. 112 for the subject matter recited in instant claims 1-19 and 28-33 of the instant application.

It is well established that the priority claims under sections 119 and 120 are evaluated on a claim by claim basis. The evaluation of the particular priority date of a claim need only be considered under circumstances in which there is an intervening reference with a critical date between the actual filing date and the date of a priority claim. The issue is moot until such a reference becomes of record. See, for example, the discussion in the context of a foreign priority claim under section 119 in MPEP § 201.15. As no reference cited in the previous Office Action meets such requirements, this issue is moot and withdrawal of the rejection is requested.

Amendments to the Specification

The specification has been amended to correct use of trademarks, by capitalizing the trademark name and indicating trademark registration status. The specification has been amended to provide current status of reference applications. The abstract has been amended to conform to MPEP § 608.01(b).

Objection to the Specification – “Part of a ring group”

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The Examiner asserted that the disclosure is objected to because the specification discloses that the R groups in the formulas $(C_6R_1R_2R_3R_4)_n$ and on the 9-fluorenylidene group disclosed can be "part of a ring" and it is not clear what is meant by the term "part of a ring group." One of ordinary skill in the art would understand that term "part of a ring group" refers to an atom or group that is bonded to other atoms or groups that form a ring system. For example, a carbon atom in a benzyl group is a part of a ring group. Particularly, for example, this terminology allows for R_1 and R_2 , as well as R_3 and R_4 , to jointly form a ring group. Applicants have attached to this response several web print outs relating to the term "part of a ring structure." As used throughout the attached print outs, the term "part of a ring structure" relates to an atom or group bonded to other atoms or groups to form a ring system. Moreover, U.S. patent subclass 536/26.11 relates to compounds where "phosphorous is part of a ring." For example, U.S. Patent No. 6,812,342 is classified in subclass 536/26.11, and Figs. 2 and 3 of the '342 patent depict a phosphorus group forming part of a ring structure (i.e., bonded to other atoms or groups in a ring). Thus, the term "part of a ring" structure or group is understood by one of ordinary skill in the art, and by the PTO, to mean an atom or group that is bonded to other atoms or groups to form a ring system. Since one of ordinary skill in the art would understand the scope of the term "part of a ring group," the specification is sufficiently clear.

Objection Under 37 C.F.R. 1.75(d)(1) and MPEP § 608.01(o)

The Examiner asserted that the specification is objected to as failing to provide proper antecedent basis for the claim subject matter under C.F.R. 1.75(d)(1) and MPEP § 608.01(o) because the term "belt" in claim 10 lacks antecedent basis in the specification. Claim 10 was amended to include the term "flexible belt," and therefore is now believed to satisfy 37 C.F.R. 1.75(d)(1) and MPEP § 608.01(o). Therefore, reconsideration and withdrawal of the objection of claim 10 under .F.R. 1.75(d)(1) and MPEP § 608.01(o) is respectfully requested.

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Rejection Under 37 U.S.C. §112

The Examiner rejected claims 3-6, 16-19, and 30-33 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner asserted that the claims are indefinite in the phrase “R₁, R₂, R₃, and R₄ comprise, each independently ... a part of a ring group.”

Claims 3, 16, and 30 have been cancelled; however, their limitations have been imported into independent claims 1, 11, and 28. Independent claims 1, 11, and 28 and claims 5, 18, and 32 have been amended, removing the phrase “part of a ring group”. Amended independent claims 1, 11, and 28 and claims 5, 18, and 32 are now believed to satisfy 35 U.S.C. §112, second paragraph. Claims 4-6, 17-19, and 31-33 depend from claims 1, 11 and 28, respectively, and therefore are now also believed to satisfy 35 U.S.C. §112, second paragraph. Therefore, reconsideration and withdrawal of the rejection of with respect to the pending claims under 35 U.S.C. §112 are respectfully requested.

Rejection Under 37 U.S.C. 102(b)

The Examiner rejected claims 28 and 32 under 35 U.S.C. § 102(b) as being anticipated by Bethell et al., J. Chem. Soc., Perkin Trans., 2, 1081-1086 (1996) (Bethell). Examiner also asserts that claim 29 and 30 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims as “the prior art of record does not teach or suggest the charge transport comprising the linking group X recited in those claims.” Claim 28 has been amended to include the limitations of claims 29 and 30, and is now believed to be in condition for allowance. Claim 32 depends from claim 28, and therefore is now also believed to

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be in condition for allowance. Therefore, reconsideration and withdrawal of the rejection of claims 28 and 32 under 35 U.S.C. § 102(b) is respectfully requested.

Rejection Under 37 U.S.C. 103(a)

The Examiner rejected claims 1, 5, 7-14, 18, 28, and 32 are rejected under 35 U.S.C. § 103(a) as being obvious over U.S. 2005/0265717 A1 (Tokarski), as evidenced by provisional application 60/483,726. The Examiner also asserts that claim 2, 15, and 29 "would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims," and claims 3, 4, 6, 16, 17, 19, 30, 31, and 33 "would be allowable if rewritten ... to include all of limitations of the base claim and any intervening claims" as "the prior art of record does not teach or suggest the charge transport comprising the linking group X recited in those claims." Independent claim 1 has been amended to include the limitations of claims 2 and 3; independent claim 11 has been amended to include the limitations of claims 15 and 16, and independent claims 29 and 30 are incorporated into claim 28. Therefore, independent claims 1, 11, and 28 are now believed to be in condition for allowance. Claims 5 and 7-10 depend from independent claim 1, claims 12-14 depend from independent claim 11, and claims 31 and 33 dependent from independent claim 28 and therefore are now also believed to be in condition for allowance. Therefore, reconsideration and withdrawal of the rejection of the pending claims under 35 U.S.C. § 103(a) is respectfully requested.

Double Patenting

The Examiner provisionally rejected claims 1, 5, 8, 9, 11-14, 18, 28, and 32 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-22 and 35-42 of copending Application No. 10/900,785 (Application '785). It is believed that the amendments to the claims made hereby negate the double patenting provisional

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rejection of claims 1, 5, 8, 9, 11-14, 18, 28, and 32. Reconsideration and withdrawal of the provisional rejection of claims 1, 5, 8, 9, 11-14, 18, 28, and 32 due to nonstatutory obviousness-type double patenting are respectfully requested.

The Examiner also provisionally rejected claims 7 and 10 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-22 and 35-42 of the Application '785, in view of Diamond, Handbook of Imaging Material, pp. 395-396. It is believed that the amendments to the claims made hereby negate the double patenting provisional rejection of claims 7 and 10. Reconsideration and withdrawal of the provisional rejection of claims 7 and 10 due to nonstatutory obviousness-type double patenting are respectfully requested.

The Examiner provisionally rejected claims 1, 5, 7-14, 18, 28, and 32 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-17 and 22-25 of copending Application No. 10/760,039 (Application '039). It is believed that the amendments to the claims made hereby negate the double patenting provisional rejection of claims 1, 5, 7-14, 18, 28, and 32. Reconsideration and withdrawal of the provisional rejection of claims 1, 5, 7-14, 18, 28, and 32 due to nonstatutory obviousness-type double patenting are respectfully requested.

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

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Respectfully submitted,

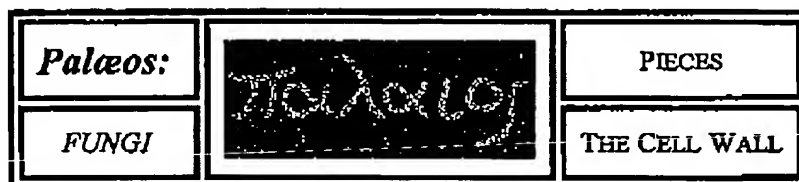


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10/804,719

Attached Print-Outs



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The Cell Wall

A Spoonful of Sugars

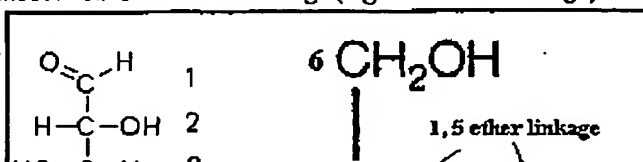
Terms defined on this page:	
anomer	hemiacetal
enantiomer	hydroxyl group
furanose	ligand
glucan	mannose
glucose	polysaccharide
glycoside	pyranose
Haworth diagram	stereochemistry
These would be on the test, if we gave one.	

Since we haven't done this elsewhere, it's time we provided the rudiments of sugar (saccharide) chemistry, so that we can make useful noises about *polysaccharides* (sugar polymers) — easily the most common class of biopolymers on the planet. A more extensive and far better introduction may be found at [Natural Products](#).

All sugar monomers of biological importance have structural formulas which looks something like this: $\text{CH}_2\text{OH}-(\text{CHOH})_n-\text{CHO}$. In other words, they consist of a chain of carbon atoms, in which each carbon atom has a *hydroxyl* (-OH) group attached to it, except for C1 (sometimes C2) which has an aldehyde or keto (=O) group.

In living organisms, the chain is generally 3-7 carbons long. In biologically important polysaccharides, the monomers are almost always 5- or 6-carbon sugars.

We have only reluctantly provided a reference graphic of a sugar monomer in linear form because, in life, 5- and 6- carbon sugars rarely occur as straight chains. The carbon atoms with the aldehyde (or keto) group reversibly bonds to one of the other carbons by "sharing" a hydroxyl oxygen, forming a C-O-C linkage. This is known as an *hemiacetal* linkage. Typically, the result is a 5- or 6-member ring — four or five carbon atoms plus the linking oxygen. A five-member form (e.g. a C1→C4 linkage) form is called a *furanose*. A six-member ring (e.g. C1→C5 linkage) is a *pyranose*. A simple example, and perhaps the most common sugar monomer, is *glucose*. Its usual (pyranose) ring form is shown in the image. It can also occur as a furanose.



In fact, the two forms are in equilibrium.

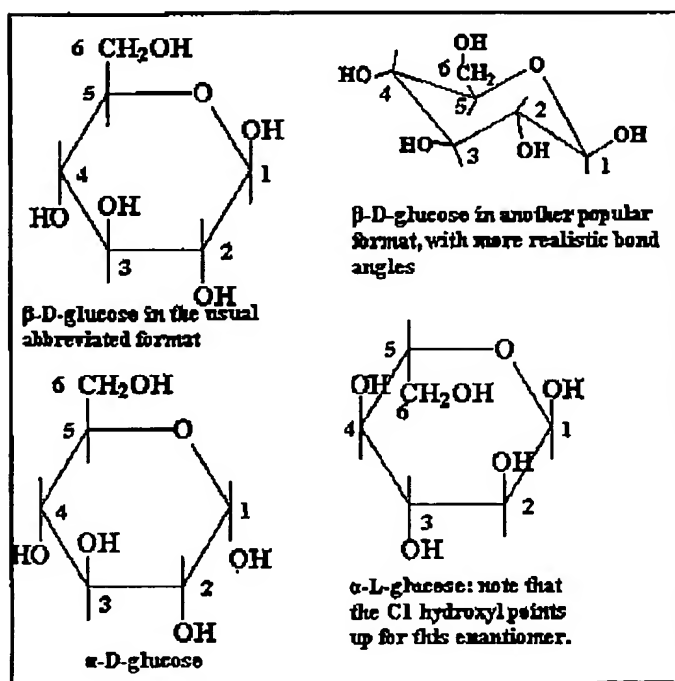
Under biologically relevant conditions, the equilibrium so strongly favors the pyranose form of glucose that we can ignore the furanose. However, this is not necessarily the case for all sugars.

This is also the last time we will show the ring carbons. By the universal convention of biochemists, carbon atoms forming part of a ring structure are not shown with a 'C' symbol. They are simply indicated by the intersection of the bonds from the various groups (*ligands*) to which the carbon atom is attached. Very frequently, hydrogen ligands (H-) are not shown either. A line with nothing at the end means a hydrogen ligand, and an unlabelled intersection of bonds means a carbon atom. See examples below.

Sugar monomers are not always quite this simple. Each of the hydroxyl ligands is moderately chemically active, and all kinds of variants exist. An example, of particular relevance to fungi, is chitin. Chitin is a polymer of N-acetyl-2-glucosamine, *i.e.*, a glucose derivative in which the ligand $\text{CH}_3\text{-CH}_2\text{-NH-}$ substitutes for the OH-group on C2. See the *chitin* glossary entry for an image.

In most of these examples, we have shown the structure of sugars using a *Haworth Diagram*. These are easy to draw and to understand, but they are rather crude tools because the bond angles are grossly distorted. Carbon normally forms tetrahedral structures, with the bonds about 108° apart. However, Haworth diagrams will do for our purposes, so long as we don't take them too seriously.

Stereochemistry



The figure above is labeled "D"-glucose for an important reason: it gives us an excuse to discuss three quick points about *stereochemistry*. Stereochemistry relates to the properties of compounds which are chemically identical, except that they are asymmetrical, and differ in the arrangement of ligands about one or more asymmetrical backbone atoms.

(1) Note that carbons 1 through 5 are asymmetrical in glucose. Each of these carbons is attached to four *different* ligands. Thus, the relative positions of the groups attached to the carbon atoms makes a difference. If, for example, we flipped the hydroxyl group on C2 so that it was *above* the ring, this would no longer be glucose. It would be *mannose*, a sugar with rather different chemical properties.

(2) If we took the mirror image of the *entire* molecule, all of the bonds would be in the same

relative position. Thus we would have a molecule that ought to have exactly the same chemical properties as glucose, which it does -- sort of. The difficulty is that, when this reversed glucose interacts with some other asymmetrical biochemical, the two molecules no longer mesh in the same way. Consequently, we must distinguish between D-glucose and its mirror image (*enantiomer*), L-glucose. Don't worry about telling the difference. The biologically relevant form for sugars is usually the D-enantiomer. You can assume a figure shows the D-enantiomer unless someone tells you differently.

(3) C1 is a special case. In the linear form, C1 is not asymmetrical because it has only three ligands. However, when the C1 forms a pyranose linkage to C5, it becomes asymmetrical. In terms of our diagram, the -OH group on C1 might point down or up. Free glucose in solution is, once again, in equilibrium between the two forms, referred to as α - and β -D-glucose. These alternate forms of the hemiacetal are referred to as *anomers*. However, this time, neither form is strongly favored. (This is also not like the glucose-mannose example, since the two forms freely interconvert.) For free glucose, the exact form at any given time is unimportant. However, when glucose is linked to another sugar through the C1 hydroxyl group, the conformation becomes "frozen." Consequently, for glucose *polymers*, we need to distinguish between α (hydroxyl down) and β (hydroxyl up) linkages (*glycoside bonds*). Incidentally, the alpha-down/beta-up convention is reversed for L-enantiomers or, naturally enough, when the sugar monomer is represented upside-down.

General Features

Fungal cells maintain a very high turgor pressure, so the integrity of the cell wall is a critical matter. Cabib *et al.* (2001). The composition of the fungal cell wall is rather variable. The variability appears to have phylogenetic significance, but few, to our knowledge, have followed that trail (*but see* Grun, 2003). In general, mycology has leapt directly from the ponderous fallacies of classical typological systematics to the facile, but sometimes equally fallacious, paradigms of molecular systematics. Consequently, there is remarkably little honest biology and biochemistry being applied to phylogenetic issues.

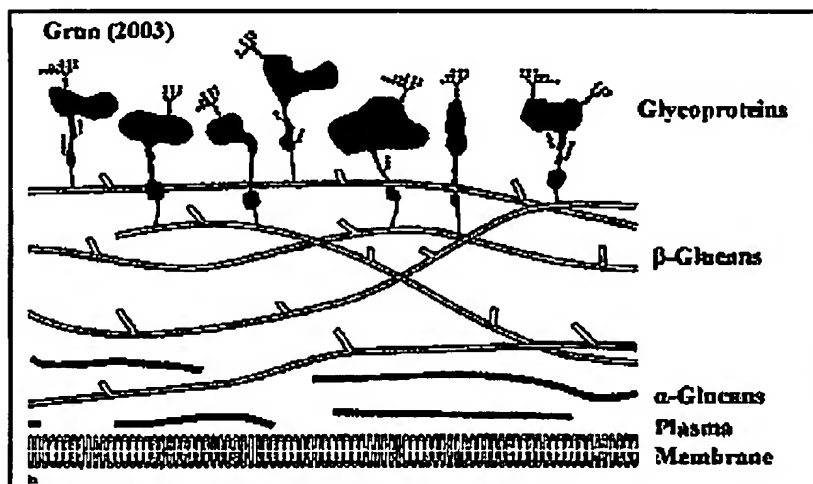
The situation is not improved by the usual non-specialist texts which characterize the fungal cell wall as a relatively simple structure made up of "cellulose" and chitin. Consider that the fungal cell wall can make up 30% or more of the dry weight of the fungus, and that the fungi are characterized by external digestion of food followed by selective absorption of the digestion products. Clearly, we can expect that the fungal cell wall will be a complex, specialized system.



It is all that; and, in addition, it is a highly dynamic system, constantly being regenerated and remodeled according to the needs of the moment. Adams (2004). Thus, many of the cell wall-associated proteins are enzymes whose function is to hydrolyze chitin and polysaccharides. The lesson is that this type of cell wall is, from a metabolic point of view, very different from insect exoskeletons or a plant cell walls, which are terminally differentiated structures.

Not unexpectedly, attempts to understand the biosynthesis of cell wall components have run into a maze of regulatory pathways which are difficult to sort out. García *et al.* (2004) applied brute force genomics methods to analyze gene responses to several different physical and chemical agents affecting cell wall integrity. The genetic responses in each case involved on the order of 100 different genes, with a significant different cohort of genes activated by each agent. Similarly, Lesage *et al.* (2004) identified 135 genes involved in the synthesis and regulation of the β -(1 \rightarrow 3)-glucan component (*see infra*) alone (*see also* several similar studies cited by these authors). In fact, it has been estimated that 20% of the *Saccharomyces* genome is involved with cell wall biosynthesis. Durán & Nombela (2004). Some efforts are being made to pare these lists down to some "core" group of pathways. However, the magnitude of the problem has only become clear in the last few years, and it is much too early to say anything useful.

Structure



We include two diagrams of the fungal cell wall by Grün (2003) and Cabib *et al.* (2001). We've also thrown in Joan Miró's (1940) *Chiffres et Constellations* just because it has somewhat the same feel to it.

While each of these images speaks to us in its own way, we will work primarily with Grün's concept. The cell wall is generally constructed of three layers: (1) an α -glucan layer (a

glucan is a polymer of glucose), (2) a β -glucan layer, and (3) an outer layer of glycoprotein. In addition, *chitin* may be a significant component of certain cell wall structures.

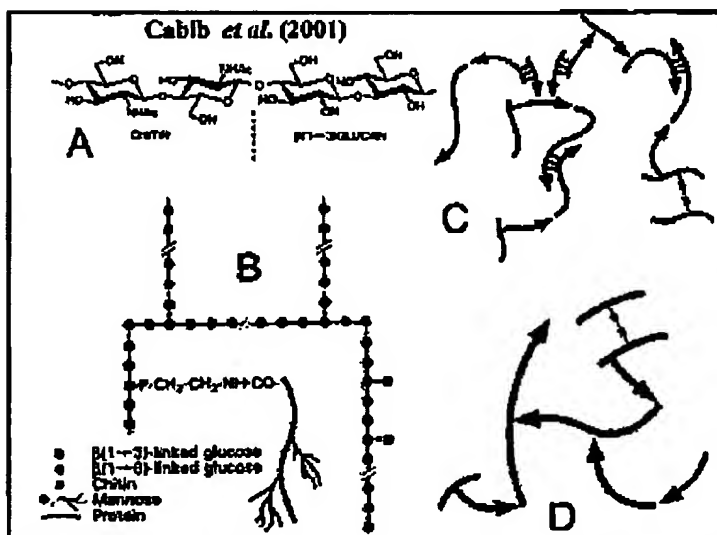
The α -glucan layer, if present, is generally composed of the α (1 \rightarrow 3)-glucan polymer. However, α (1 \rightarrow 4) glycosides are variably present. Compare glycogen, which is α (1 \rightarrow 4)-glucan with (1 \rightarrow 6) side chains. Where present, the α -glucan material appears as a fibrillar layer adjacent to the plasma membrane and is thought to serve a largely structural role, stiffening the basal layer of the cell wall.

The α -glucan layer is rarely represented in diagrams of the fungal cell wall because it does not occur in *Saccharomyces*, which is the usual model system. In fact, it has a rather peculiar

phylogenetic distribution. Among ascomycetes, the alpha glucan is found in *Schizosaccharomyces*, but is not known from any other yeasts. The material is common among all groups in the Pezizomycotina. However, in Lecanoromycetes, a very large proportion tends to be in the $\alpha(1\rightarrow4)$ form. Alpha glucans also form a significant, sometimes even dominant, part of the cell wall in many basidiomycetes, but are completely absent outside the Hymenomycetes. Grün (2003). Although *Schizosaccharomyces* is often classified with the yeasts, its position is probably more basal. A number of studies show it branching with (paraphyletic) taphrinomycotines. See, e.g., Liu *et al.* (1999), An *et al.* (2002). We tend to prefer the methodology of these studies, which are neither biased by the superficial similarities of "yeast" forms nor confused by the usual problems with *rDNA* and *mtDNA*. Thus, it appears likely that the alpha glucan layer is primitive for all higher fungi, or at least for Ascomycota, with subsequent multiple losses.



The bulk material of the cell wall is usually in the form of $\beta(1\rightarrow3)$ -glucan. This forms a very stable hydrogen-bonded triple helix in solution, and probably *in vivo*. The packing of these triple helix structures appears to be controlled by the size and frequency of very short (1 \rightarrow 6) side chains, sometimes consisting of only a single glucose monomer. Grün (2003). If so, this clearly provides a method for controlling the structure and conformation of the cell wall very simply and with very fine, localized control. However, essentially no work appears to have been done in this area. If anyone out there is looking for a potentially elegant and informative dissertation topic in a virtual research vacuum, this is it.



In addition to $\beta(1\rightarrow3)$ -glucan, the cell wall contains $\beta(1\rightarrow6)$ -glucan. We emphasize that this is not simply a $\beta(1\rightarrow3)$ -glucan with big side-chains, but a polysaccharide with a true $\beta(1\rightarrow6)$ backbone. This material may be peripheral to the bulk $\beta(1\rightarrow3)$ -glucan and is, in any case, strongly involved in cross-linking the various components of the cell wall, as shown in the figure from Cabib *et al.* (2001).

The outermost layer of the cell wall is composed of diverse proteins bearing polysaccharide side chains

composed of mannose. The usual explanation is that these are attached through their mannan side

chains via a (1→3) linkage with the $\beta(1\rightarrow6)$ -glucan. However, this is only a model. Real life appears to be very much more complex, involving a wide variety of different interactions between glycoproteins and bulk cell wall materials. Pitarch *et al.* (2002).

Finally, the fungal cell wall contains variable amounts of *chitin*. In many systems chitin is a major constituent of the cell wall. In others, it is involved only in cell division or reproductive structures and is virtually absent otherwise. Again, we are reluctant to say much about it, absent more detailed, phylogenetically-grounded studies of the actual ultrastructure in particular cases.

In general, the study of the fungal cell wall tends to be strong on models and somewhat weaker on data. One virtue of the brute force genomic and proteomic studies now being produced is that they clearly confront us with the scope of the problem. Fungal cells probably lack the diversity of metazoan tissues. However, each fungal cell must, for that very reason, be competent to perform a much wider variety of functions than a typical terminally-differentiated metazoan cell. Consequently, their superficial similarity and simplicity are likely to mask a very complex, plastic biochemical repertoire. Perhaps, after all, the Miró is the best representation, given the current state of our knowledge. ATW051113.

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US PATENT SUBCLASS 536 / 26.11-- .~.~.~.~ The phosphorus is part of a ring

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US PATENT SUBCLASS 536 / 26.11

.~.~.~.~ The phosphorus is part of a ring

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536 / **HD** ORGANIC COMPOUNDS – PART OF THE CLASS 532-570 SERIES

* **DD** ORGANIC COMPOUNDS (Class 532, Subclass 1) {1}

1.11 **DE** .~ Carbohydrates or derivatives {15}

18.7 **DE** .~.~ Nitrogen containing {13}

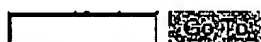
22.1 **DE** .~.~.~ N-glycosides, polymers thereof, metal derivatives (e.g., nucleic acids, oligonucleotides, etc.) {12}

26.1 **DE** .~.~.~.~ Phosphorus containing N-glycoside wherein the N is part of an N-hetero ring {9}

26.11 ➡ .~.~.~.~.~ The phosphorus is part of a ring {2}

26.12 **DE** .~.~.~.~.~> The N-hetero ring is part of a purine ring system {1}

26.14 **DE** .~.~.~.~.~> The N-hetero ring is a diazine or a diazole ring, including hydrogenated



DEFINITION

Classification: 536/26.11

The phosphorus is part of a ring:

(under subclass 26.1) Compounds wherein the phosphorus is part of a ring structure.

(1) Note. Examples of compounds provided for herein are: [figure]

http://www.patentec.com/data/class/defs/536/26_11.html

3/7/2006

PAGE 30/33 * RCVD AT 8/31/2006 5:52:19 PM [Eastern Daylight Time] * SVR:USPTO-EFXXRF-2/3 * DNIS:2738300 * CSID:6123499266 * DURATION (mm-ss):09-04

US PATENT SUBCLASS 536 / 26.11-- ~.~.~.~ The phosphorus is part of a ring

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EXAMPLES

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to General,

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Kosmoi.com > Science > Chemistry > Organic:

Organic chemistry is the branch of chemistry concerned with the study of carbon-containing molecules known as organic compounds. (except carbon dioxide and monoxide. Although there is an overlap with biochemistry, the latter is the specific study of the molecules made by living organisms.

Some of the classes of substances studied in organic chemistry include: aliphatic compounds which deals with chains of carbon which can be modified by functional groups; aromatic compounds which are compounds having a benzene ring or similar group; heterocyclic compounds, compounds which include non-carbon atoms as part of a ring structure; physiologically active compounds which have an effect on the human body; and polymers - long chains of repeating groups.

Aliphatic compounds

Hydrocarbons -- Alkanes -- Alkenes -- Halogenoalkanes
- Alcohols -- Ethers -- Aldehydes -- Ketones - Carboxylic
acids -- Esters -- Carbohydrates -- Alicyclic compounds
-- Amines -- Amides -- Amino acids

Aromatic compounds

Arenes or Aromatic hydrocarbons -- Benzene --
Aromatic amines -- Phenols

Heterocyclic compounds

Pyrrole -- Porphyrin -- Chlorin -- Corrin

Physiologically active compounds

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Concepts

Organic nomenclature -- Chemical formula -- structural formula -- skeletal formula -- Organic reactions

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Ira Blei

History

For some time it was believed that organic compounds could be produced only by living organisms (hence the name) until the synthesis of urea by Friedrich Wöhler in 1828.

Advanced
Organic
Chemistry:
Structure
and
Mechanis...
Francis A.
Carey,
Richard J.
Sundberg

Characterisitics of organic substances

The reason that there are so many carbon compounds is that carbon has the ability to form many carbon chains of different lengths, and rings of different sizes. A lot of carbon compounds are extremely sensitive to heat, and generally decompose below 300°C. They tend not to be so soluble in water compared to many inorganic salts. In contrast to such salts, they tend to be much more soluble in organic solvents such as ether or alcohol. Organic compounds are covalently bonded.

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